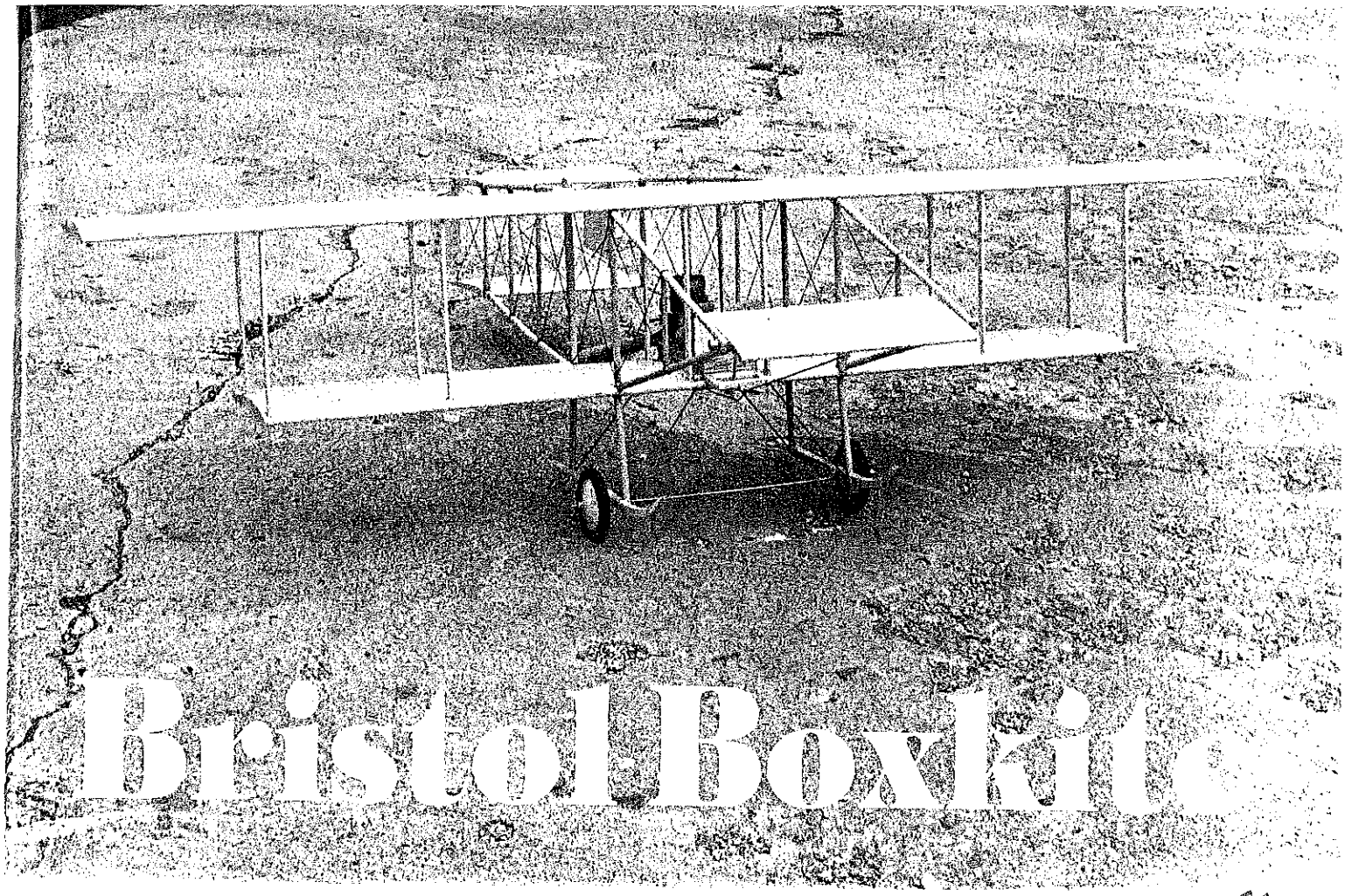
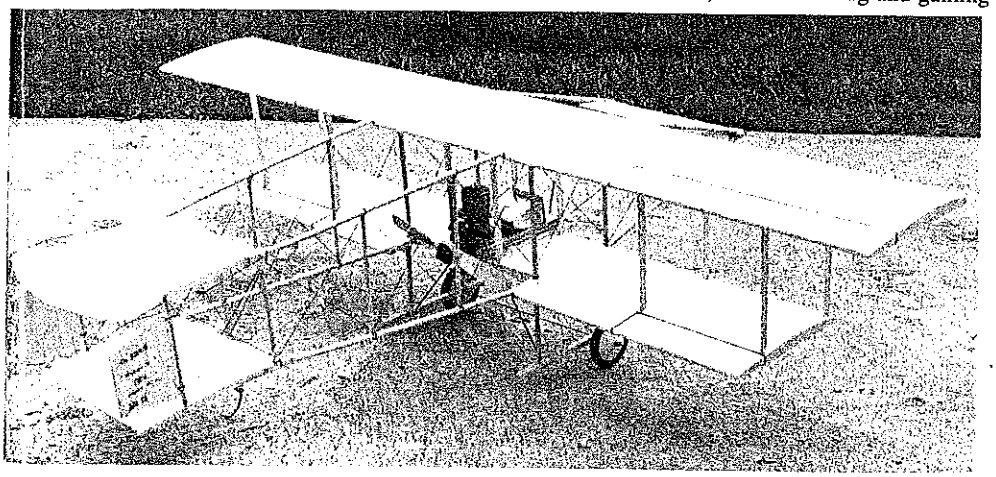


Bristol Boxkite

For the dawn-of-aviation enthusiast, this CL duplicate of Henry Farman's pioneering Boxkite should get the nostalgia juices running. The model has a 42½-in. wingspan and is set up for .25 power. ■**Dave Haught**

THE PROBLEM with indulging oneself, they tell you, is that you can never get enough. Once you start, it's difficult to stop. That certainly held true with my Control Line model of Levavasseur's Antoinette, a design from the pioneering days of aviation ("CL Antoinette," July 1989 *Model Aviation*). After building and gaining experience flying this historic airplane, I felt the need for something more.



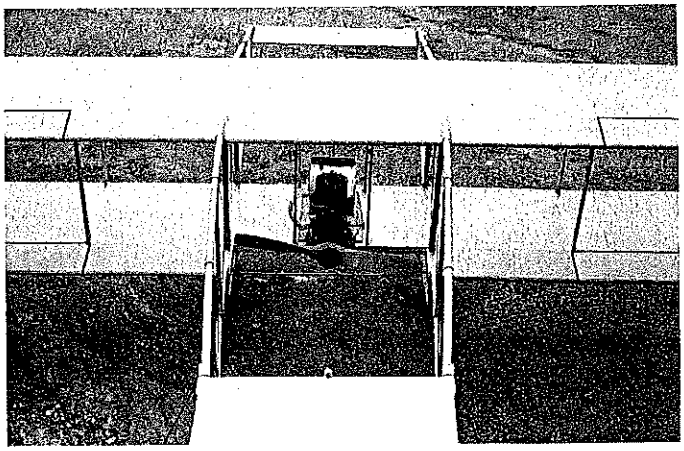
Top picture: Buckets of drag, you say? Not really. To cut down on drag, the Boxkite model eliminates much of the wire rigging between the wings and interplane struts in the full-size prototype. The model captures the look and feel of the original Boxkite, yet remains a practical flying machine. Above: Perched like a spider in its web, the engine is really not as inaccessible as it appears. The scale rigging between the booms has been omitted for easier access to the engine. The wedge-style fuel tank looks quite authentic and works great, too.

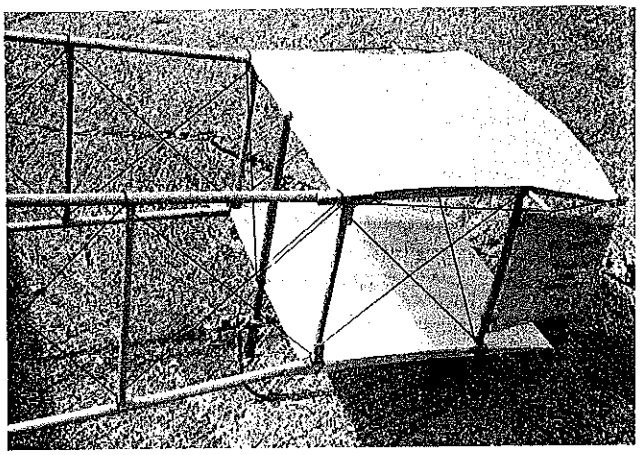
The sight of the sun shining through the clear doped covering on those late afternoon flying sessions is hard to forget. It takes you back to a time when aviation was simply the miracle of flight itself. In that earlier era, flying wasn't about speed and stunts. From start to finish, a flight was an achievement, a moment of accomplishment. I'm afraid the Antoinette has opened a vein of nostalgia, a thirst that must be quenched often. I found myself having to fly the model all the time. After a while, even that wasn't enough.

Reading *The First Air Race* nudged my imagination further still. If I was going to pursue vintage flight, why not fly two planes instead of just one? Maybe even two could be flown at once, in the same circle—even a race!

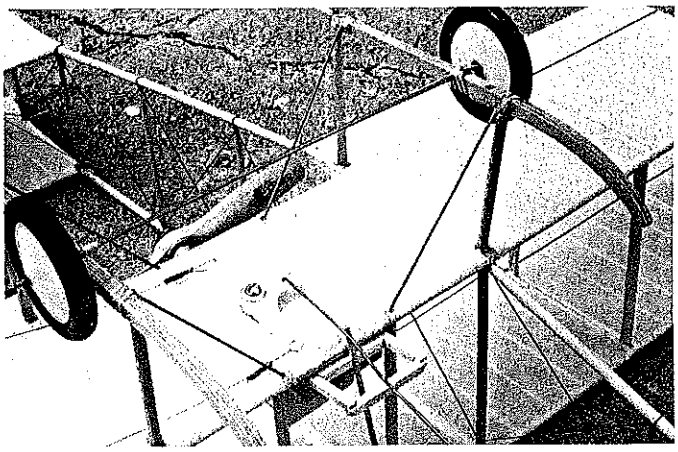
The Bristol Boxkite was a competitor in many an air race back in the second decade of this century. An overnight rental of the movie, "Those Magnificent Men in Their Flying Machines," swept all doubt aside. I knew I wanted a model of the Boxkite.

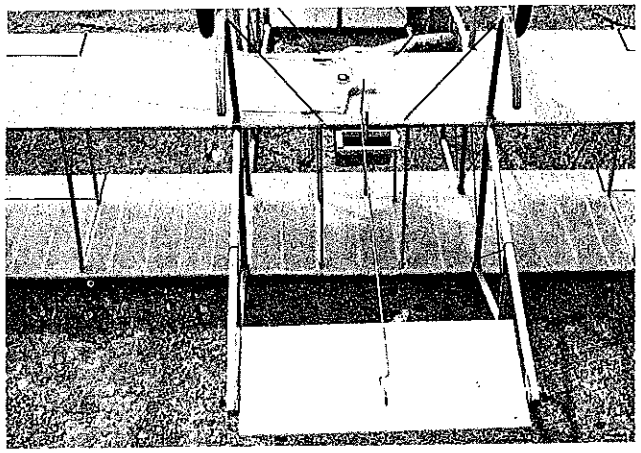
In the beginning the idea seemed hope-



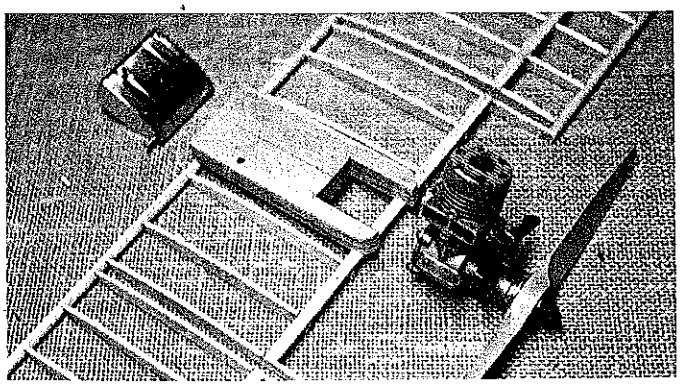


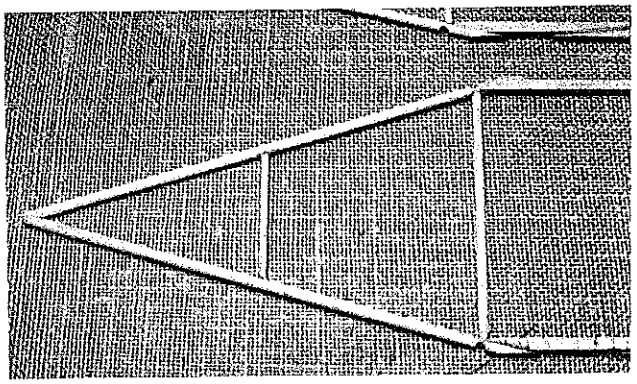
Left: This is what the pit crew chief gets to see of the Boxkite. There is room to get in and out safely. The glow plug leads have to be attach from the front of the model. The pusher prop is a commonly available 8 x 4, cut down to achieve ¼-in. clearance from the side frames. Do forget to balance it. Right: The twin stabilizers are securely fastened to the booms with plywood T-gussets and wrapped with thread. The tw rudders are set with right turn, which is very effective because of the direct propwash. The shock-absorbing tail skid duplicates the origin





Left: The underside showing the hefty bellcrank mounted out of the way on the bottom of the wing. The wire struts forming the landing g are sewn to the leading and trailing edge spars and then to the landing skids. The axle is wrapped with rubberbands to the skids just as the original. Right: Unlike the original Boxkite, which used the front canard and the elevator for control, the model uses only the front cana This simplifies control wire hookup. Control response is immediate, though, so be careful. The canard pivots on an aluminum tube sp





Left: The engine mounting plate may seem excessive, but there is little else to distribute power to the airframe. Weight in this case is l important than strength. Note the hole near the back of the mount for the fuel tank overflow hose. Drill the engine mounting holes and stall the blind nuts before assembly, as there will be no room later. Right: The booms under construction. Make certain *all* the dowels straight-grained—such a fragile structure won't forgive *any* weak links. Shape the mating ends with round files for the closest fit possil

less. The Boxkite seemed so fragile. I was certain a model structure would be difficult to design—and that if it ever flew, it wouldn't survive the first landing. Questions nagged me, even haunting my sleep. I recalled reading an article on modeling a Curtiss Pusher for Control Line at some point in my youth. It seemed to work back then; why not now? I decided to try it!

On my library shelf sits an old, well-worn volume—*Pioneer Aircraft 1903-1914* by Kenneth Munson. Small and compact, Munson's book was the prize of a childhood trip taken many years ago. I've often wondered how many times I've read and studied each and every page. Many a vintage aircraft project, from my Free Flight Fokker Spin to this rendition of the Boxkite, first struggled into being as I browsed through this book. It's no wonder that the pages are beginning to work loose.

When I was 10, the drawings of the Farman biplane in the Munson book had jum to life. I'd had no trouble imagining the tual airplane. There are better sources t my dog-eared volume. *Flight Magazine* ten featured the Farman between 1912 1924 and included a good amount of det But I wanted this Boxkite to be specia wanted it to answer the dreams of of that year-old I once was. So once again I tur to the trusty drawings and specification

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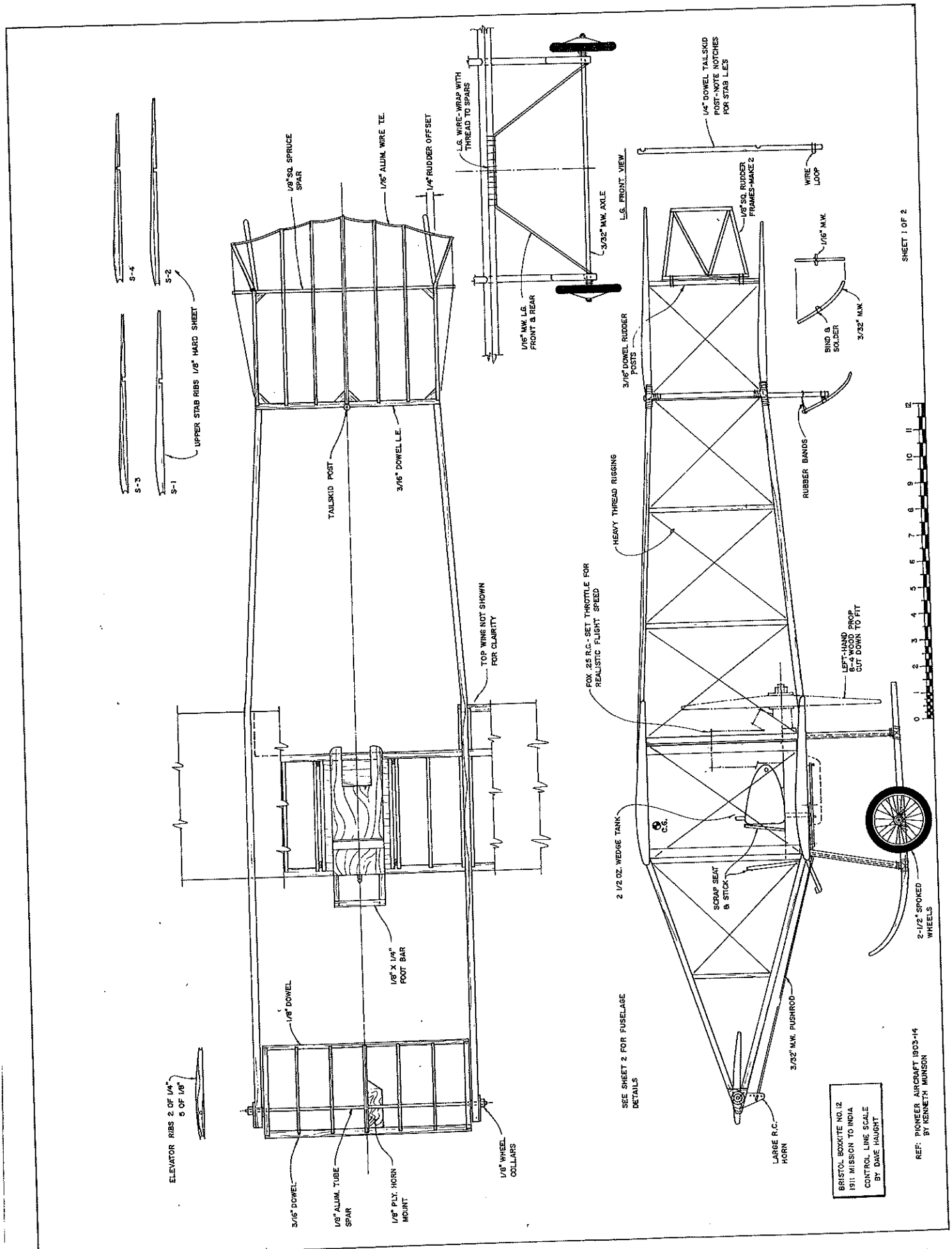
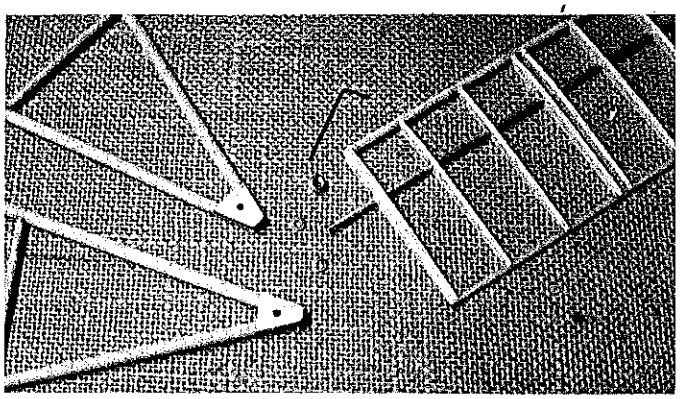
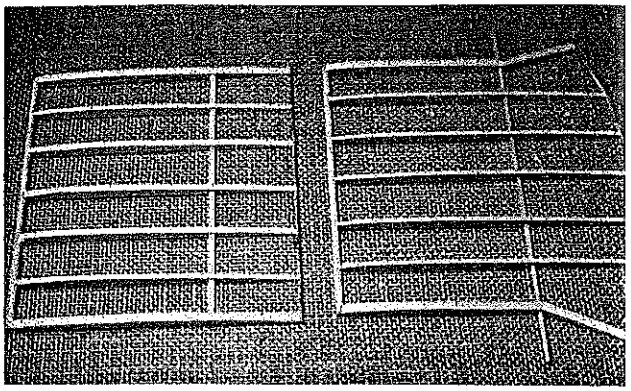
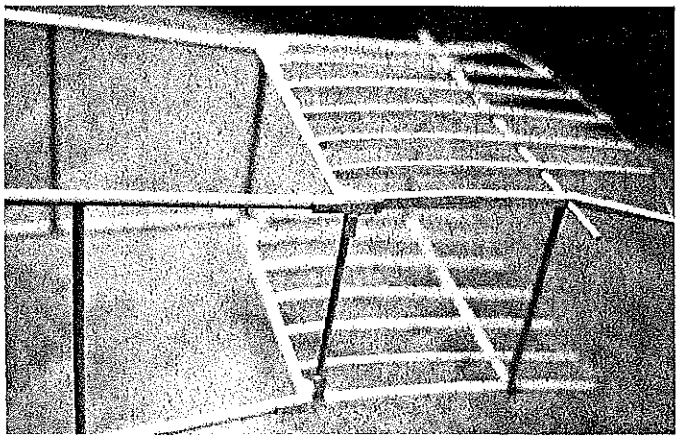
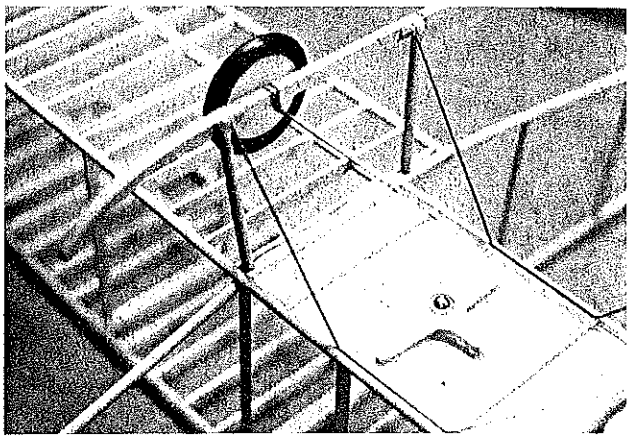

S-4
S-2
S-3
S-1
UPPER STAB RIBS 1/8" HARD SHEET
1/8" SQ. SPRUCE SPAR
1/16" ALUM. WIRE T.E.
1/4" RUDDER OFFSET
TAILSKID POST
3/16" DOWEL L.E.
TOP WING NOT SHOWN FOR CLARITY
1/8" X 1/4" FOOT BAR
1/8" DOWEL
3/16" DOWEL
1/8" ALUM. TUBE SPAR
1/8" PLY. HORN MOUNT
1/8" WHEEL COLLARS
ELEVATOR RIBS 2 OF 1/4" 5 OF 1/8"
L.G. WIRE-WRAP WITH THREAD TO SPARS
3/32" M.W. AXLE
1/16" M.W. L.G. FRONT & REAR
L.G. FRONT VIEW
1/4" DOWEL TAILSKID POST-NOTE NOTCHES FOR STAB L.E.'S
WIRE LOOP
1/16" SQ. RUDDER FRAMES-MAKE 2
1/16" M.W.
BIND & SOLDER
3/32" M.W.
3/16" DOWEL RUDDER POSTS
HEAVY THREAD RIGGING
RUBBER BANDS
FOX .25 R.C.-SET THROTTLE FOR REALISTIC FLIGHT SPEED
LEFT-HAND 6-4 WOOD PROP CUT DOWN TO FIT
2 1/2 OZ. WEDGE TANK
C.G.
SCRAP SEAT & STICK
2-1/2" SPOKED WHEELS
3/32" M.W. PUSHROD
LARGE R.C. HORN
SEE SHEET 2 FOR FUSELAGE DETAILS
BRISTOL BOXKITE NO. 12
1911 MISSION TO INDIA
CONTROL LINE SCALE
BY DAVE HAUGHT
REF: PIONEER AIRCRAFT 1903-14
BY KENNETH MUNSON
SHEET 1 OF 2





Left: On the right is the canard/elevator with its aluminum tube spar installed. At left are the front fuselage booms showing the plywood bra ets that act as bearings. Washers and set collars anchor the assembly together. Right: The upper (at right) and lower stabilizer frames rea for gussets and interplane struts. The trailing edges are made from 1/16-in. aluminum welding rod to simulate the wire on the original Boxki





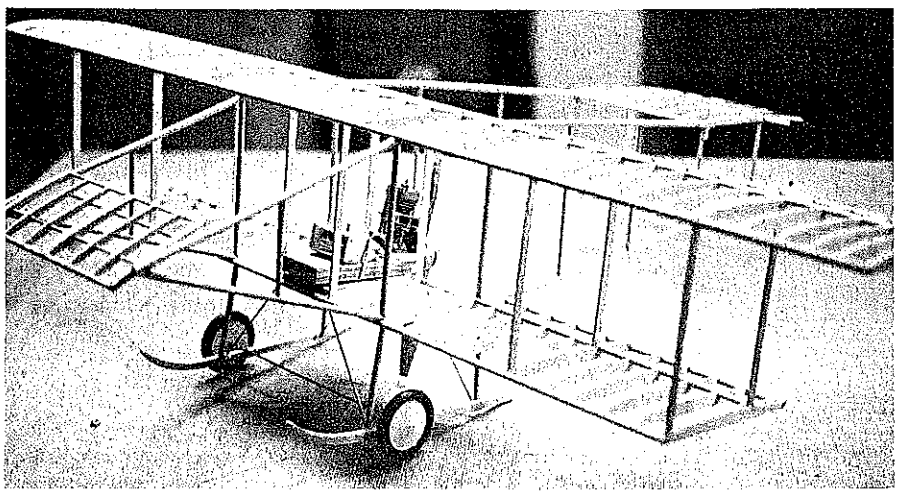
Left: Close-up view of the T-gussets used to attach the elevators to the fuselage frames. Combined with glue and thread wrapping, they ma a very strong attachment. Be sure to use *all* the gussets shown on the plans, as they are very important to the model's overall strength. Rig Designing strength into the airplane without distorting its looks required considerable thought. Here you can see the very strong full-de vibration-absorbing 3/8-in. plywood bellcrank mount and the center section webbing, all of which will be hidden when the model is cover

Pioneer Aircraft 1903-1914.

The Boxkite name was loosely affixed to nearly all of Englishman Henry Farman's early three-flying-surface designs. The Bristol Company of England obtained the license to build the Farman Biplane in 1910. Over 70 variations were produced. The one that caught my fancy conjured romantic images of the British Empire, its rudder marking boldly proclaiming it Number 12 of the mission to India.

Since the Antoinette was designed around the Fox .25 engine, and I had two of them, it seemed logical to design the Farman around the same engine. These are throttled RC engines, and I set the throttles on both the Antoinette and the Boxkite to deliver just enough power to fly. Too much power spoils the realism as they lumber into the air, half flying and half floating.

Because of its simple lines and scant structure, enlarging the plans for this aircraft was not difficult. The real task lay in designing a practical model around such simplicity. As many of my encounters with Scale models have taught me, successfully duplicating the full-size craft depends on using materials that are as close to the original as possible. Designing and constructing Antoinette last year paved the way. Do els, plywood, wire, and a lot of hea thread are the primary materials used on Boxkite.



The nearly completed model in its bare bones. Unlike most models, Boxkite is covered after it's assembled. Though this isn't difficult, it *is* time-consuming. Set aside a rainy Saturday.

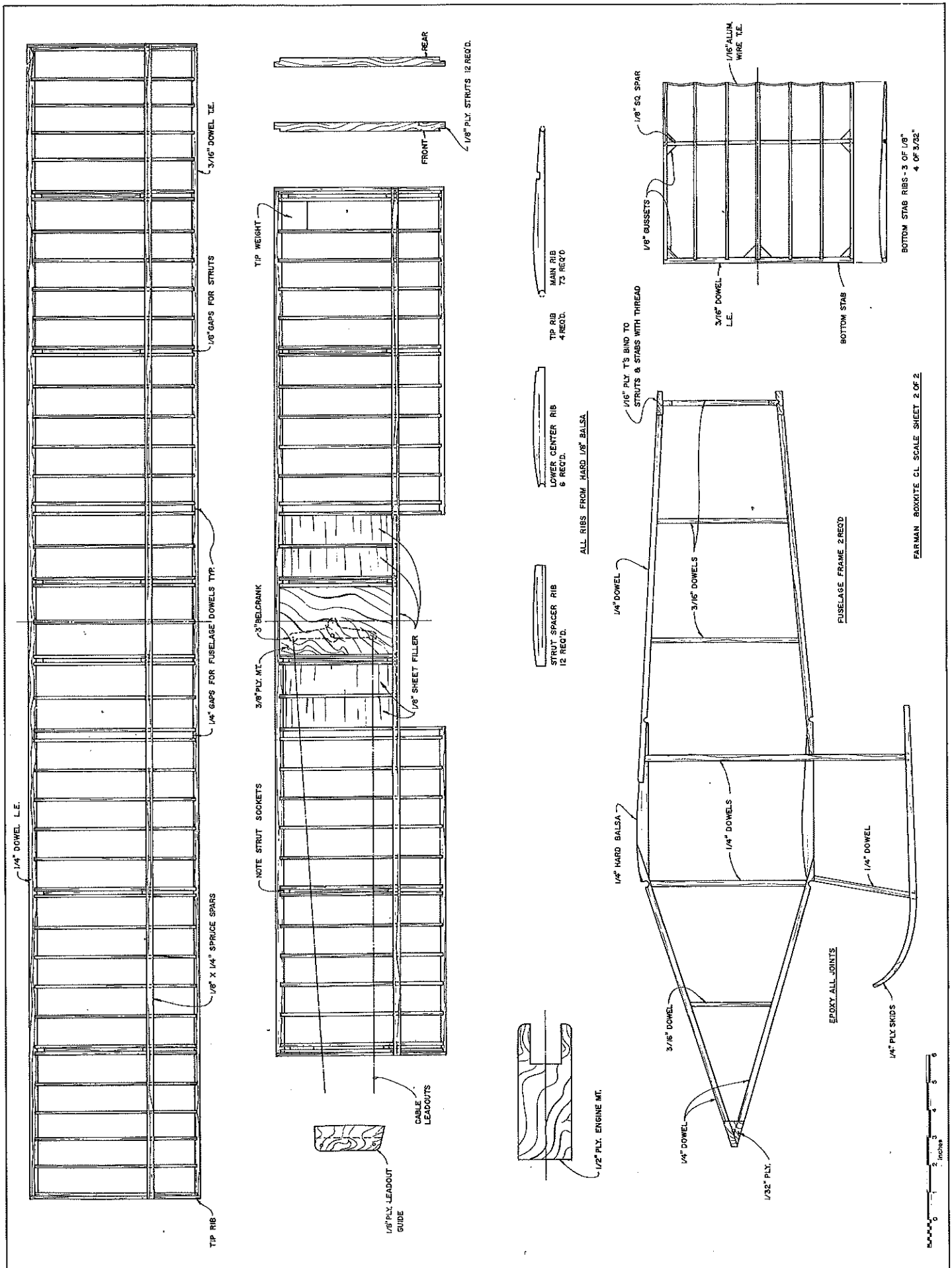
Construction

If you've caught the same bug I have, le get started building *your* Boxkite. Hi around until you find a hardware store t carries 48-in.-long dowels, then amaze annoy) the clerk by pawing through the tire stock to find enough good, straight, straight-grained dowels to do the job. Wa the grain! A dowel can be straight, yet ha bad grain that runs obliquely, so that diag nal breaks are more likely. Search ur you've found the best of the lot. It's very i portant to have sound components in eve part of the structure.

Fuselage. Construct the two side fram Make them as nearly identical as possib Cut out two of every part for an exact mat The frames are built one at a time, just you would the sides of a stick fuselage.

Mate all dowel joints as precisely as p sible. By using a collection of 1/4- , 3/16 and 1/8-in. round files, I was able to ma the joints almost perfect. Take your ti with these joints. If any part is not qu right, toss it and make a new one. Carefu

Continued on page 1


1/4" DOWEL L.E.
3/16" DOWEL T.E.
1/8" GAPS FOR STRUTS
1/4" GAPS FOR FUSELAGE DOWELS TYP.
1/8" X 1/4" SPRUCE SPARS
TIP RIB
REAR
FRONT
1/8" PLY. STRUTS 12 REQ'D.
TIP WEIGHT
3/8" PLY. MT.
3" BELCRANK
1/8" SHEET FILLER
NOTE STRUT SOCKETS
CABLE LEADOUTS
1/8" PLY. LEADOUT GUIDE
TIP RIB 4 REQ'D.
MAIN RIB 73 REQ'D.
LOWER CENTER RIB 6 REQ'D.
STRUT SPACER RIB 12 REQ'D.
ALL RIBS FROM HARD 1/8" BALSA
1/2" PLY. ENGINE MT.
1/16" ALUM. WIRE T.E.
1/8" SQ. SPAR
1/8" GUSSETS
3/16" DOWEL L.E.
BOTTOM STAB
BOTTOM STAB RIBS - 3 OF 1/8" 4 OF 3/32"
1/16" PLY T'S BIND TO STRUTS & STABS WITH THREAD
1/4" DOWEL
3/16" DOWELS
FUSELAGE FRAME 2 REQ'D
1/4" HARD BALSA
1/4" DOWELS
1/4" DOWEL
3/16" DOWEL
EPOXY ALL JOINTS
1/4" PLY SKIDS
1/4" DOWEL
1/32" PLY.
FARMAN BOXKITE CL SCALE SHEET 2 OF 2
inches

slightly narrower than the Fourmost engine mount, which can be sanded to fair in.

Cut the ¼-in. ply firewall to shape. Install blind nuts to fit the Fourmost engine mount (see advertisers index for Fourmost products), and epoxy the firewall in place. Make several additional ¼-in. ply firewalls to space the engine out in achieving the proper balance point. My Shuriken required one spacer. The Chinese CS will require none.

Carve the fuselage and canopy to final shape, and sand smooth.

Assembly and finishing. Prime and sand all parts smooth before assembling. Use thin CyA (cyanoacrylate) glue for final assembly. Fillets can be made from drywall joint compound. Unless you're smarter than I am (not much IQ required), you'll have to cut windows in the model to rig the controls.

I applied Sig sanding sealer, then sprayed on three coats of Sig butyrate dope. The finish coat was Black Baron clear gloss polyurethane. Be sure to apply any vinyl markings before the gloss coat.

The landing gear can be mounted between the engine mount and firewall. I opted to drill the engine mount and insert the gear. This system seems to be indestructible.

Rather than use wheel collars, assuming that you're using 3/32 landing gear wire, try counterdrilling (with a ⅛-in. bit) aluminum-hub wheels ⅛ in. deep on both sides. Solder a ⅛-in.-long, ⅛-in. brass tube in place to serve as the inner retainer. Next, slip another, longer ⅛-in. tube into the wheel, and solder it in place. Cut the tube and protruding axle flush with the wheel hub. This makes a sleek installation.

Flying. Install an extra ¼-in. spacer between the engine mount and firewall for your first flights. This will make the model more nose-heavy and less sensitive to the controls. The shim can be removed later if greater controllability is desired.

Start with relatively short lines (about 35 ft.). *Do not* use braided or Dacron lines for Monoline controls. *Only* solid lines will work (available from Kustom Kraftsmanship). While the AMA rules permit .014 lines, it's recommended that you begin with .018 for better control.

A good method of ensuring that Monoline controls are in neutral before flying is to relax the line to see whether it has any curls. If so, straighten them out by twisting the unit by hand. You can then center the control knob by spinning it to the center of travel.

Use typical precautions when taking off. Don't apply too much *up* control until speed increases. With Monoline, you'll still have control even with a momentarily slack line, so don't panic.

Your Shuriken Streak will be a fast and stable flier. Have fun!

FF Scale/Warner

Continued from page 73

magic elixir! Eric, who flies a C-130 as well as RC Pattern, says he reads the column because he's fascinated by FF Scale (which is great for me to hear).

Anyway, I applied a square of Peck's finest Japanese tissue to the ol' test frame and applied the Fibe-Mini solution to a not too tight covering job. Alas, it tightened up just like water. Undaunted, I then tried Fibe-Mini straight out of the bottle, and guess what? It performed as advertised and *loosened* the tissue!

If you can't see the possibilities for this, you've never had tissue-induced warp. The trick is to get just the right strength for what you want. Now all we have to do is find a domestic source. As the label information is almost all in Japanese, I can't even give ya a Japanese source other than the base commissary at Yokota. Keep your eyes open the next time you're at a market in Little Tokyo in L.A., or elsewhere.

Fiskars drill: Another product that I think modelers will find useful is available at most hardware stores. It's a plastic hand drill about 8 in. long with a 3-in. throw on the handle that will pack in the windings at 3½:1. It has a pistol grip and dead-smooth gearing. I put a bent nail with the head behind the chuck jaws (a #10 flat washer slipped down to the head helps) and tested it out on a short motor with three loops of ¼-in. rubber. I had no trouble putting in full winds. I don't know how long it will last under that kind of punishment, but it seems to be pretty sturdy. At $9 this little black beauty should make a nice addition to your go box. *Continued on page 179*

Boxkite/Haught

Continued from page 76

glue each joint with 15-to-30-minute epoxy for maximum strength.

When one side is finished, cover it with plastic wrap and build the second side directly atop it. This will help to ensure that both sides are the same.

Add the plywood gussets at the nose and the T fittings at the rear. The landing skids can be added as well.

Stabilizers. The stabilizers have different configurations but they're built in the same manner. Cut out all the ribs, then file the concave leading edge of each using your 3/16-in. round file. Notch the spar locations, and file a notch in each rib's trailing edge to fit the 1/16 aluminum wire trailing edge. You can get this wire from your local welding shop in 3-ft. lengths. It's neat stuff to have around.

Pin the leading edge dowels and spars over the plan. Pin down the ribs next, then the trailing edge. CyA (cyanoacrylate) glue works best for these assemblies. For major assemblies, however, use epoxy.

When the glue is dry, lift the stabs off the plans and install the 1/8-in. gussets. There are a lot of them. Take your time and position them carefully so that they won't show through the covering and detract from the model's appearance. Sand the structures carefully, and set them aside.

The front elevator/canard does the flying. On the full-size Boxkite it was coupled to the rear stabilizers by cables, but on the model that's unnecessary. The front elevator is very effective all by itself.

Cut out the ribs, and file out the concave leading and trailing edges. Cut out the plywood control horn mount. The main spar is made from 1/8-in. aluminum tubing. The ribs are drilled and slipped over the spar, then pinned down to the plans where the leading and trailing edge dowels are glued on. Install the control horn plate so that it's flush with the bottom of the elevator. The aluminum spar must extend about ½ in. beyond the end ribs.

Wings. Now the real fun begins. Cut out all the wing parts. There are a *lot* of ribs. I stack cut 15 or so at a time. The spacer ribs for the struts are short; and you can easily modify six standard sizes from your boxful of stack-cut ribs for the lower center ribs.

Build the top wing first. Pin down the leading edge, followed by the ribs, trailing edge, and spars in that order. Note the ¼-in. gaps for the fuselage frames near the center. It's easy to get caught up in the building process, and then realize too late that you allowed only a 1/8-in. gap. Pin everything down, and check it carefully. When completely satisfied with position and alignment, glue the wing assembly together with CyA.

The bottom wing is a little more challenging. Repeat the process used on the upper wing. After the glue is dry, cut and fit the 3/8-in. plywood bellcrank mount. "Three-eighths-inch plywood?" you ask. Yes, and for good reason. Because they lack the rigidity that sheeting and bridging give, open-structured designs like the Boxkite are highly subject to vibration. The plywood bellcrank mount helps absorb the engine load and transmit it evenly to the rest of the airframe.

The 1/8-in. sheet webbing between the center section ribs performs the same function. Make sure these webbing sheets fit snugly between the ribs, positioned just below the tissue surface.

The bottom wing gets the tip weight; I used four pennies' worth. The lead-out guide is also installed on this wing, with the bellcrank located on the bottom. Drill the mounting hole for the bellcrank, and install a blind nut.

Make the interplane struts, and use some labeling system to differentiate between the front and back struts. The engine mount can be sawn from ½-in. plywood and predrilled for the blind nuts. Temporarily position the engine mount on the lower wing, and drill through it for the fuel overflow tube.

Trial fit the finished fuselage frames to both wings. The frames should slip neatly into the gaps in the wings. It may take some juggling and popping a few joints to get everything to come together right. Pin the whole works together, and start measuring. The gap between the top and bottom leading and trailing edges must be the same. Make whatever adjustments are necessary to ac-

Continued on page 184

complish this, then epoxy the wings to the fi

Once set, block up the model on the work so that the wings are level with the table i directions. Block up the lower stabilizer so matches the rear of the fuselage frames, an it in place on the T fittings.

After cutting the dowel rudder posts to a which will keep the upper stabilizer paralle the lower one, glue on the upper stabilizer. is all a lot easier to do than to explain. Aft epoxy has cured, stand back and admire wooden sculpture. It reminds me of a din skeleton in a museum at this stage.

Add the interplane struts. Fit them int slots left at each strut bay by the spacer Before gluing any of the struts in place, me the gap between the wings to be sure it's equal along their entire length.

The engine mount can be installed at this p Set it at 0-0 thrust.

Bend the landing gear brace wires, and b out a roll of heavy thread. Begin by sewing landing gear wires to the wing leading and t ing edges. Wrap the T fittings joining the stab ers, which greatly strengthens these joints gives them an authentic appearance. Finish of wrapping the landing skid-to-wire joints.

The simple twin rudders should be made at point from ⅛-in.-sq. sticks. Sand all the ed round and prepare them for covering.

Covering. Most models are covered before fi assembly. Not so with the Boxkite. Set asid Saturday, lock yourself in the workshop, and to work.

Apply four coats of clear dope to the ent model, sanding between each coat. I used hea silkspan for the wings and lightweight silksp for the elevator and stabilizers.

Begin by cutting strips of tissue wide enough fit between the struts chordwise. Cover the b tom wing first, working from top to bottom. F the top wing, cover the bottom first, and then t top.

The elevator is simple, but the stabilizers ne a little explanation. Cover the bottoms of t stabs first. Apply an extra bit of dope on the ti sue at the trailing edge, then cover the top. Pre the tissue together at the trailing edge outside the wire. Leave an extra bit of tissue at the trai ing edges until a few coats of dope have been ap plied to seal the tissue to the wire. When dry trim the tissue close.

Finish the Boxkite with four or five coats o clear dope, or until the tissue begins to exhibit nice sheen and looks slightly transparent.

Make up the tail skid parts, and epoxy them t the leading edges of the stabilizers.

Install the front elevator by opening the front fu selage frames wide enough to allow the tubing spar to slip into the holes drilled in the frames. Don't forget to slip a washer between the frame and the root rib.

Add the wheel collars that secure the elevator, and install the control horn on the bottom of the el evator. Bend to shape and install the pushrod and lead-outs. Check the controls for free movement, and correct any binding. The vintage wheels can be installed on their axle and the axle rubber-banded to the skids. My prototype has wire spoke wheels, but I'm not sure how well they'll stand up to prolonged use.

Mount the engine and fuel tank, dummy seat, and footrest. The rudders can be sewn to the rud der posts and the offset glued in place.

Rigging. This is another fun part. I chose to use enough to add charm, but not so much as to create unnecessary drag. It was restricted mostly to the fuselage frames. Check out the photo graphs and rig to your heart's content. Remem-

ber that what you do rig needs to be done well, as it's all out there where everyone can see it. Keep it tight; CyA it as you go, pulling it tight all the way.

Flying. By now you're pretty familiar with your Boxkite. It's time to give it a final check and head out for the "aerodrome." Correct any adverse warps in *all* the surfaces. Trim down an 8 x 4 prop to fit between the frames with at least ¼-in. clearance at the closest point in its arc. Balance the prop as best you can by carving and/or sanding the heaviest blade. Balance your Boxkite so that it's nose-heavy for the first flight. The front elevator is very sensitive, so the model will try to porpoise if you're not ready for it.

Practice your starting procedure before you actually fuel up. Getting the glow plug clips off and adjusting the needle valve need to be worked through *before* the engine is running. Once you've powered up, if you feel excessive vibration or see any loose parts, shut the engine down and make any necessary repairs or adjustments.

Enough of all these caveats and worries! The Boxkite is designed to be a flying model. Enjoy it, and be ready for the nostalgia bug to bite. Kenneth Munson's book is chock-full of other pioneer designs that await your talents as a modeler. Dream on!

Gopher Canyon/Wilson

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into understanding and measuring noise.

Figure 1 shows a series of curves which relate noise intensity and frequency to a noise rating number, N. From tables 1 and 2 we can estimate the public reaction to these N numbers.

Referring to Table 2, for example, since we desire no public reaction we select a corrected noise rating of less than 40—say, 35. From Table 1 we find an appropriate noise rating correction factor which must be subtracted from the noise rating. That's +5 in this case. If the field is in a suburban rather than a rural setting, we would use a correction factor of 0. Since this must be reflected in the corrected noise rating number, we must use values of N = 30 for rural, or N = 35 for suburban in the graph of Figure 1.

A two-cycle engine speed of 12,000 rpm would generate an exhaust fundamental frequency of 200 Hz. Following the N = 30 line to 200 Hz, we get a noise intensity of 44 dB. This means that if we present a noise of 44 dB at 200 Hz to the neighbor's property line, we might safely expect no reaction. Assuming that our airplane measures 90 dB at 9 ft., we'll need a reduction of 46 dB. According to the law of the inverse square, this requires a distance ratio of 200 (199.52 to be precise). That is, the distance to the neighbor must be 9 x 200 = 1,800 ft.

Now if we increase the rpm to 18,000, we have a fundamental frequency of 300 Hz. Again reading the graph in Figure 1, we find an allowable noise intensity of 38 dB at 300 Hz. This requires a drop of 52 dB, which translates to a distance ratio of 400 (398 exactly) or a distance to the neighbor of 3,600 ft.

At the other extreme, if we reduce the rpm to 6,000 our distance of acceptability drops to 900 ft.

Note that these calculations are all based upon sound measurements taken with flat "C" weighting, *not* "A" weighting. This is because the weighting is accounted for in the ISO curves.

It should be apparent from these figures that the practice of measuring sound power in dB alone is fundamentally inadequate for a noise-sensitive field. Considering frequency as well as dB—that

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